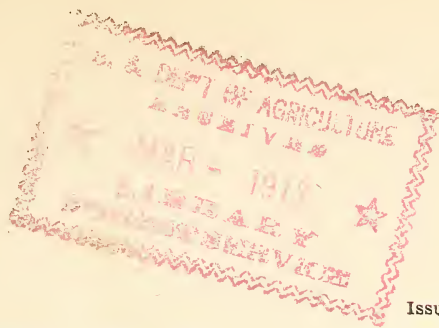


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THE CHINESE WOOD-OIL TREE.

BY

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AN OLD WOOD-OIL TREE 30 FEET HIGH IN FULL FLOWER IN WESTERN SZECHWAN,
CHINA, ON THE BANKS OF THE YANGTZE RIVER.

(Photographed by Mr. E. H. Wilson, Arnold Arboretum Expedition, 1908.)

THE CHINESE WOOD-OIL TREE.

INTRODUCTION.

The Chinese wood-oil or tung-oil tree (*Aleurites fordii*) is grown on the heavy-clay hillsides and waste places along the Yangtze River above Hankow, where the rainfall is heavy and the climate is similar to that of some of our Southern States, although the temperature does not go so low in winter. The tree is probably not very long-lived and would be comparable in this respect to the silver maple. It drops its leaves in winter and does not wake up early in the spring, like many trees, and therefore is not likely to be severely injured by late frosts.

The flowers come out before the leaves. They are fully as large as catalpa flowers, and the tree in bloom is a very pretty sight. As an ornamental the wood-oil tree (Pls. I and II) is likely to prove about as desirable as the catalpa, but the soft wood is of little value and, like many other soft-wooded trees, the branches break off easily in heavy winds.

The Chinese wood-oil tree commences to bear fruit when 4 or 5 years old. The fruits are the size of small apples—from 2 to 3 inches in diameter. (Pl. III.) They contain from two to eight (most commonly five) large, oily seeds, that are reported to be poisonous and should not be eaten. They at least have a purgative effect, similar to that of the castor bean, to which the wood-oil tree is botanically distantly related. The yield of these nuts in China is reported to be from 30 to 75 pounds per tree.

ECONOMIC VALUE OF WOOD OR TUNG OIL.

The value of this Chinese tree lies in the fact that the nuts contain one of the best drying oils known, called wood or tung oil. In recent years this oil has produced, it is reported, a revolutionary effect on the varnish industry of the United States. It has largely taken the place of kauri gum and has made possible the manufacture of a quicker drying varnish, which is less liable to crack than that made from kauri gum, and has been found of special value in waterproof priming for cement.

This valuable oil constitutes about 23.9 per cent of the substance of the nuts, and its market price, which is normally 6 to 7 cents per pound, has risen recently to 12 cents. If figured out on the basis of 1 pound of the applelike fruits yielding 0.58 pound of nuts and 0.138 pound of oil, a pound of fresh fruits would be worth from 0.82 cent to 1.6 cents, and a bushel, which would weigh approximately 27 pounds, would be worth from 22 to 43 cents, depending on the market price of the oil. For comparison, 65 cents a bushel is considered a fair price for apples.

Not more than 108 trees (i. e., 20 by 20 feet apart) should be planted to the acre, and this would mean a possible gross yearly return of from \$23 to \$46, depending on the market price of the oil figured on the above basis. One 8-year-old tree belonging to Mr. W. H. Raynes, of Tallahassee, Fla., bore this year 852 fruits, practically 2 bushels, which would make the gross returns from \$46 to \$92 an acre, provided that all the trees in an orchard did as well as this one.

CULTIVATION.

In the neighborhood of Tallahassee, Fla., land suitable for the cultivation of the Chinese wood-oil tree is selling for \$10 to \$15 an acre, and land on which it will grow can probably be had for much less. The cost of planting, cultivation, and marketing would probably not exceed \$15 an acre yearly, so that as a tree crop this wood-oil tree is worthy of consideration by the owners of cheap lands in the South.

Experiments might be made in blasting holes for the reception of the trees where soil conditions render digging difficult in the ordinary way. Since the trees are rapid growers, it is also probable that it will be satisfactory if the soil is kept free of weeds for a space of 4 feet on each side of the row and the center space between the rows left in sod. After an orchard is well established it may not require any cultivation, although possibly the increased crops would more than pay for the cost of clean culture.

PRODUCTION OF WOOD OIL.

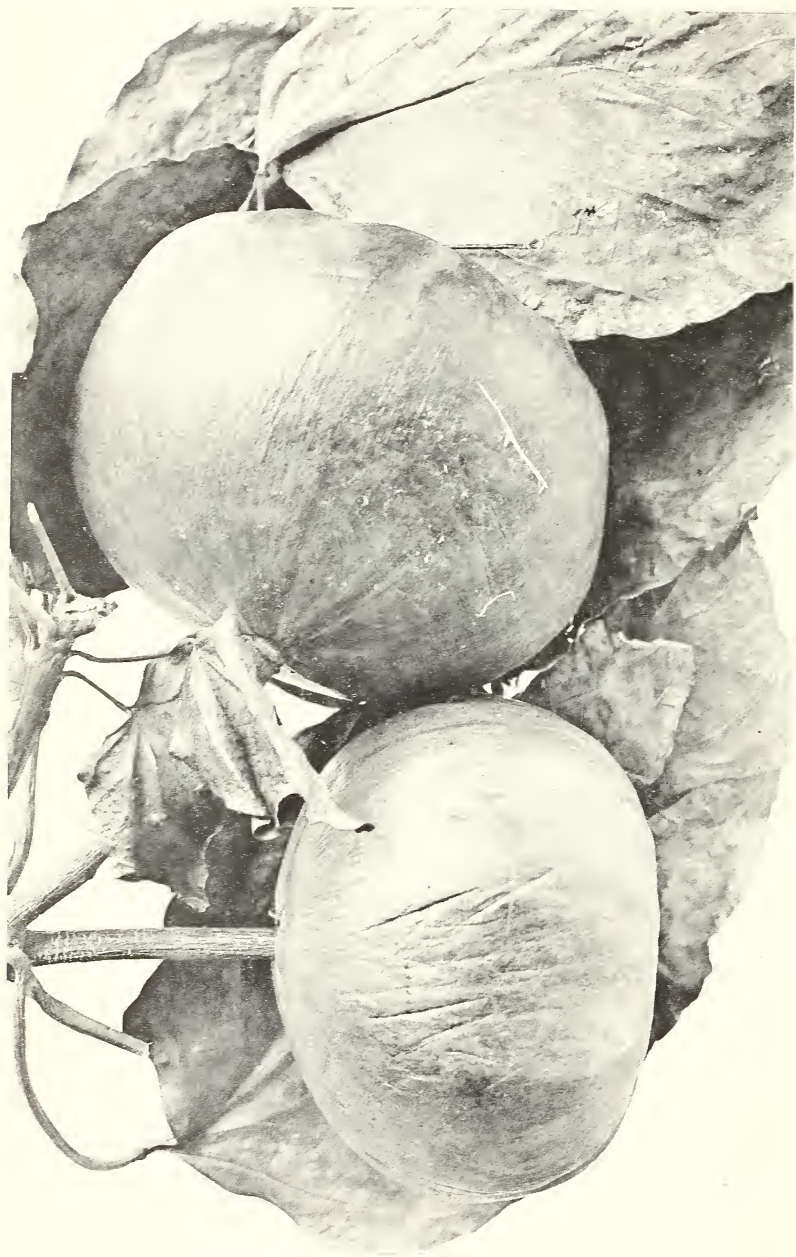
The work of gathering these large fruits will not, in all probability, approach the cost of gathering apples, which is commonly 5 cents a bushel. The nuts are removed from the husks very readily after the fruits have been stacked in heaps, and the process of crushing and extracting the oil is not likely to be more expensive than the extraction of cottonseed oil. It is also probable that the same or similar machinery can be used for the expression of wood oil.

In China, according to reports, after the fruits have been gathered and the husks removed, the nuts are put into a large iron pan about



WOOD-OIL TREE IN FULL BLOOM, NEAR TALLAHASSEE, FLA., ON THE ESTATE OF MR. WILLIAM H. RAYNES.

This tree was imported as a seed from Hankow, China, by Mr. L. S. Wilcox in 1905. It bore 410 fruits in 1911 and 852 fruits in 1912, approximating 1 and 2 bushels, respectively. It has not been injured by a temperature of 14° F.



GREEN FRUITS OF A CHINESE WOOD-OIL OR TUNG TREE, GROWING ON THE ESTATE OF MR. A. S. HOPKINS, BILOXI, MISS. These fruits contained normally from 3 to 5 nuts, about half the weight of the fruits and the nuts are nearly one-quarter by weight composed of the tung oil. From 30 to 75 pounds of the nuts is supposed to be the average yield of a tree in China.

18 inches in diameter and are stirred over a fire until parched. The seeds are then ground into a fine meal, which is heated or steamed before it is put in the press, supposedly for the purpose of assisting in the extraction of the oil.

POSSIBILITIES OF THE WOOD-OIL INDUSTRY.

In starting an oriental industry in America the most important factor to be considered is the amount of hand labor involved. There does not appear to be much involved in this industry, as the gathering and husking of the fruits seem to be the only hand work required.

The freight haul from China to America is a water haul practically all of the way, but instead of its acting as a tariff wall to protect the grower in this country it apparently acts as a handicap, at least at the beginning of such an industry. According to recent freight rates a grower in Montgomery, Ala., routing his product to Mobile by rail and thence by water to New York, would have to pay 86 cents per 100 pounds, whereas his Chinese competitor at Hankow pays only 61.5 cents per 100 pounds to ship around the world to New York. However, it is not to be expected that these rates would be maintained in case the supply of oil became an important article of commerce. There enters into this discussion, however, the factor of a home supply of the material, and undoubtedly this is very desirable.

The American farmer has the advantage over the Chinaman of cheap, accessible lands and team labor. Since the hand labor involved in a well-planned orchard is not great, it would seem to be entirely possible by the systematizing of such an industry on large plantations to produce this wood oil more cheaply than it is now produced by the wayside plantings in China, which must be very wasteful of human labor. This labor factor in China is now becoming an important one, as the cost of labor is rapidly rising. It seems reasonable, therefore, to suppose that the American extensive method of handling such a tree crop would in time overtake and outstrip the back-yard and wayside methods of the Chinese.

The prospects are that there will be a continual and growing demand for wood oil. Five million gallons were imported from China last year. The growing use of soy-bean oil, it is reported, will tend to increase rather than decrease the consumption of wood oil, as soy-bean oil dries too slowly and requires an addition of wood oil to help it dry. The home demand in China is likely to increase and the opinion of importers seems to be that the American-grown oil could capture the market. If it does, 40,000 acres of trees would be required to supply the present demand.

There now remains to be considered the very important question whether the American-grown trees will produce as good a product as

the Chinese trees. This problem still remains to be determined, but will doubtless be settled in the course of a few months. There seems to be no basis for the theory, however, that the oil produced here by the same species of tree will be materially different from that produced in China. Whatever differences have already been observed in the small samples which have been expressed from the nuts produced in Florida are attributed by Dr. Rodney H. True, of the Office of Drug-Plant, Poisonous-Plant, Physiological, and Fermentation Investigations, to the method of extraction of the oil rather than to any specific difference in its composition.

SUMMARY.

To sum up the whole wood-oil situation as it stands to-day in the minds of investigators of the Department of Agriculture:

An important plant industry, involving a present area of 40,000 acres and a possible one of several times this acreage, is here represented.

Chinese wood-oil trees have grown and fruited well in South Carolina, Florida, Alabama, Louisiana, Mississippi, Georgia, Texas, and California. These trees are growing on cheap land and do not require very careful attention. The tree has stood a temperature as low as 4° F., at Clemson College, S. C., without injury, except the loss of a few of the small lateral branches, and is slow to start into growth even when subjected to a temperature of 80° F. It is therefore not so liable to be injured when this temperature is immediately followed by a drop to 18° F. There are large regions in the South where the temperature for decades at a time does not go below zero Fahrenheit, and it is in these that it should be tried. Until it is known just how low a temperature the wood-oil tree will stand without injury it is not safe to predict the northern limit of its probable cultivation.

The distribution of several thousand wood-oil trees through the South in 1906 and 1907 has brought in a considerable amount of information as to the behavior of the tree in this country. From these data it appears that the tree has done best in the more moist parts of the Gulf coast region, on deep loam soils which are underlain with stiff clay. The sticky gumbo soils of eastern Texas seem unfavorable to its growth, and it has not done well on the almost pure sand soils of Florida.

The wood-oil tree quickly recovers from frost injury, sprouting up again from the stump. Being of rapid growth, it should recover more quickly than an orange tree. The indications are that the blooms may be occasionally caught by late frosts, as they open in March in the latitude of Tallahassee, Fla., but in this respect they seem to be less liable to injury than pear and peach trees.

The Department of Agriculture will have on hand one year from now for distribution to bona fide experimenters a limited number of 1-year-old trees, and these will be ready to send out in February and March. Applicants for them must have the necessary conditions of soil, temperature, and rainfall and the actual intention to take up the serious study of this industry before their requests for plants can be granted. Experiments with single trees have been made, and what is now desired is the creation of acre plantations in the hands of private individuals.

Approved:

JAMES WILSON,

Secretary of Agriculture.

WASHINGTON, D. C., November 29, 1912.

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